

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF DECEMBER 7, 2007

Prepared on November 19, 2007

ITEM NUMBER: 15

SUBJECT: **CLEANUP AND ABATEMENT ORDER NO. R3-2007-0077 CONCERNING OLIN CORPORATION, 425 TENNANT AVENUE, MORGAN HILL, SANTA CLARA COUNTY**

KEY INFORMATION:

Location:	425 Tennant Avenue, Morgan Hill, California, approximately 30-miles southeast of San Jose and 0.5-miles west of Highway 101.
Responsible Party:	Olin Corporation Inc.
Current Owner:	Olin Corporation Inc.
Type of Operations:	Manufacture of Signal Flares
Type of Discharge:	Potassium Perchlorate
Existing Orders:	Cleanup or Abatement Order (CAO) No. R3-2005-0014 and CAO Order NO. 2007- 0112

SUMMARY:

The purpose of this proposed Cleanup and Abatement Order (CAO) No. R3-2007-007 is to require implementation and completion of all necessary offsite investigation and groundwater cleanup remedial actions (hydraulic control and cleanup) associated with the perchlorate plume emanating from the Olin Corporation facility in Morgan Hill (Facility).

The proposed CAO requires that Olin to proceed with immediate implementation of a phased groundwater cleanup approach within the Llagas Subbasin, as approved, conditioned and clarified in the Central Coast Water Board's forthcoming response letter concerning Olin's June 15, 2007, *Llagas Subbasin Cleanup Work Plan, Olin/Standard Fusee Site, Morgan Hill, California* (Cleanup Work Plan). The proposed CAO outlines the approved cleanup strategy. The approved cleanup remedy includes implementation of hydraulic containment and treatment of groundwater (i.e., pump and treat) in the area of highest concentrations (plume core) combined with monitored attenuation for those areas with lower perchlorate concentrations.

The CAO applies to the entire Facility and to all areas beyond the property boundary, in all directions, that have been impacted by perchlorate that originated from the Facility. The proposed CAO requires that the Discharger shall cleanup perchlorate-impacted groundwater to achieve background concentration within each individual aquifer zone and those portions of the Llagas Subbasin impacted by discharges from the Olin site, or a less stringent cleanup level consistent with State Water Board Resolution 92-49 and approved by the Executive Officer. The background concentration is the level of perchlorate that would exist in groundwater without regard to any discharges from the Facility.

If any part of the Facility plume has commingled with other plumes with an identifiable source, the Executive Officer may require the Discharger and the other sources to jointly cleanup the commingled plume to background (the level of perchlorate that would exist without regard to any of the subject discharges).

Central Coast Water Board staff will present an outline of the proposed CAO No. R3-2007-0077 at the Central Coast Water Board meeting on December 7, 2007. Central Coast Water Board staff will recommend the Board direct the Executive Officer to sign and issue the proposed CAO, as presented.

DISCUSSION:

Background

Potassium perchlorate was used to manufacture highway road flares from 1956 to 1995 at the Olin facility (Facility) located at 425 Tennant Avenue in Morgan Hill, Santa Clara County. Perchlorate entered groundwater from the Facility, which resulted in a groundwater plume that extends approximately 10 miles southeast and east of the Facility and over 500 feet deep downgradient of the Facility. Perchlorate has degraded groundwater in the shallow, intermediate, and deep aquifer zones in the Llagas Subbasin.

Geology/Hydrogeology

Groundwater in the region typically occurs in alluvial sediments, at depths ranging from 7 to 568 feet below ground surface. The alluvial deposits are composed of heterogeneous layers of clay, silt, sand, and gravel. Interconnected multiple aquifers exist within the area. Groundwater underneath the site is generally unconfined, although there are identified confined zones within the sub-basin to the southeast of the property. The groundwater flow direction is predominantly to the south-southeast with occasional variation to the south and south-southwest. Detailed description of geology and hydrogeologic conditions within the Llagas Subbasin are included in Olin's January 31, 2007, *Llagas Subbasin Characterization – 2006*, Santa Clara County Olin/Standard Fusee, Morgan Hill, California (2006 Characterization Report).

Onsite Remediation

Olin first detected perchlorate in onsite shallow groundwater in August 2000. To address offsite migration of perchlorate, Olin performed onsite soil remediation (source removal) and an onsite groundwater containment and treatment system. Olin has completed soil cleanup at the Facility. Performance-monitoring results indicate that Olin has effectively treated and achieved the Central Coast Water Board's remedial goal of 0.05 milligram per kilogram for onsite soils. The on-site groundwater treatment system continues uninterrupted operation. The treatment system began operation on February 23, 2004. Groundwater is extracted at a rate ranging from 50 to 175 gallons per minute (gpm). Extracted groundwater is filtered, and perchlorate is removed to non-detectable concentrations using an ion-exchange process. The treated groundwater is re-injected at a rate of 50 to 250 gpm. Olin continues to evaluate the effectiveness of the extraction and re-injection system to ensure that hydraulic control is occurring. The onsite groundwater treatment system has removed 73 pounds of perchlorate from the shallow and upper intermediate aquifer to date.

Recent perchlorate concentration data show consistent declines in shallow aquifer perchlorate concentrations in both onsite and in Area 1 wells. We believe these decreases in perchlorate concentrations are due to the successful onsite soil cleanup and the operation of the onsite groundwater treatment system. Based on these results, additional hydraulic control measures (south of the Facility) are not deemed necessary at this time.

Olin reports and significant correspondence can be accessed on our website at: <ftp://swrcb2a.swrcb.ca.gov/pub/rwqcb3/Olin%20Perchlorate/>

Compliance History

In general, Olin has remained in regulatory compliance with Central Coast Water Board directives. Olin has achieved compliance with the majority of the terms and conditions outlined in existing CAO No. R3-2005-0014 and is in satisfactory compliance with replacement water requirements, as outlined in State Board Order WQ 2005-0007 and our October 6, 2006 correspondence. With the exception of a couple of extension requests that were appropriately justified and approved, Olin's progress with respect to required investigation and cleanup activities is excellent.

Proposed CAO No. R3-2007-0077

Proposed CAO No. R3-2007-0077 applies to the entire Facility and to all areas, in all directions, beyond the Facility boundary and to each aquifer zone for those portions of the Llagas Subbasin impacted by discharges from the Facility. The proposed CAO No. R3-2007-0077 requires implementation and completion of all necessary offsite investigation and remedial actions (hydraulic control and cleanup) associated with the perchlorate plume emanating from the Facility. This CAO also requires additional

assessment activities and includes an updated schedule to ensure timely and effective completion of the necessary investigation and remedial actions.

Implementation of the phased approach includes hydraulic containment and treatment of groundwater (i.e., pump and treat) in the area of highest concentrations (plume core) in combination with monitored attenuation for those areas with lower perchlorate concentrations. Olin is required to evaluate the effectiveness of the phased cleanup approach to determine the need for modifications or implementation of more aggressive measures that Olin may need to implement to achieve compliance with groundwater cleanup requirements. The approved cleanup strategy includes the following components:

- **Extraction Wells:** Installation of a sufficient number of dedicated groundwater extraction wells at appropriate locations within the plume core (i.e., Priority Zone A) that exists within the intermediate and deep aquifer zones to achieve effective hydraulic control of perchlorate-impacted groundwater to downgradient areas, and achieve compliance with groundwater cleanup requirements.
- **Monitored Attenuation:** Monitored attenuation is conditionally approved as a remedy component of the approved groundwater cleanup strategy and shall be implemented throughout the areas of the Llagas Subbasin with lower concentrations of perchlorate. Monitored attenuation shall apply to all portions of the Llagas Subbasin outside of the plume core (within the shallow, intermediate and deep aquifer zones), including those portions of the deep aquifer zone immediately east and northeast of the Facility.

Due the uncertainties concerning the long-term effectiveness and the predicted timeframes estimated for groundwater cleanup, the CAO requires Olin to evaluate the effectiveness of the phased cleanup approach to determine the need for modifications or implementation of more aggressive measures that may be needed to achieve compliance with groundwater cleanup requirements. The approved phased cleanup approach, as conditioned and clarified, is outlined in our Central Coast Water Board's response letter concerning the Discharger's June 15, 2007, Llagas Subbasin Cleanup Work Plan, Olin/Standard Fusee Site, Morgan Hill, California.

Furthermore, the proposed CAO requires Olin to implement the monitored attenuation remedy component in strict accordance with USEPA's guidance document¹ concerning the use of monitored attenuation at groundwater cleanup sites. As such, Olin is required to continuously evaluate and demonstrate that the selected cleanup approach (monitored attenuation in conjunction with hydraulic control and treatment measures) will effectively achieve remediation objectives within a timeframe that is reasonable compared to that offered by other methods. The phased cleanup strategy shall be evaluated by implementing an approved Performance Monitoring Program and a Remedial Contingency Plan. The Performance Monitoring Program is necessary to

¹ United States Environmental Protection Agency, OSWER Directive Initiation Request, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," April 21, 1999.

evaluate whether the monitored attenuation remedy option is performing as expected and is capable of attaining the cleanup level within the anticipated (reasonable) timeframes. The Remedial Contingency Plan is a backup remedy that provides for modification of the approved groundwater remedy, if the monitored attenuation component fails to perform as anticipated.

The proposed CAO No. R3-2007-0077 specifically:

- Outlines and summarizes the most significant elements of the approved groundwater cleanup strategy and the means by which Olin proposes to implement the cleanup of perchlorate in groundwater in the Llagas Subbasin,
- Defines how Olin will monitor and assess the effectiveness of the remedial programs,
- Provides clarification concerning the cleanup goal for the impacted areas of the Llagas Subbasin,
- Outlines the approved implementation plan for hydraulic containment and treatment of the plume core (i.e., the area of highest perchlorate concentrations in groundwater) combined with a plan for the demonstration of monitored attenuation in those parts of the Llagas Subbasin that contain perchlorate at lower concentrations, downgradient from or adjacent to the plume core.
- Outlines the anticipated schedule for design, implementation, and startup of the approved groundwater remedy.
- Proposed CAO No. R3-2007-0077 updates and replaces CAO No. R3-2005-0014 and CAO Order No. R3-2006-0112.

The proposed CAO takes a very conservative approach towards groundwater cleanup because we are responsible for providing adequate and appropriate protection of the public's drinking water supply. As such, the proposed CAO also includes the following additional groundwater cleanup requirements:

- The Discharger shall install ion exchange (IX) systems on all domestic water supply wells that are actively used as a potable source and with perchlorate concentrations greater than 8.0 micrograms per liter ($\mu\text{g/L}$) (or parts per billion). The Discharger is required to operate and maintain the IX systems and provide an alternative water supply until compliance with State Board Order No. WQ 2005-0007 is achieved. Central Coast Water Board selected this concentration as a trigger for cleanup of domestic supply wells because we are concerned that wells at or above this concentration will remain impacted and subject to replacement water for an extended period of time. Domestic supply wells that contain lower concentrations may achieve the replacement water "trigger" concentration of 6.0 $\mu\text{g/L}$ (i.e., MCL) sooner.
- By April 15, 2007, the Discharger shall submit an Intermediate Aquifer Zone Cleanup Work Plan that specifically addresses the implementation of a groundwater containment system within the intermediate aquifer zone. The Cleanup Work Plan shall propose a specific groundwater containment system (hydraulic control and

cleanup) that will provide effective plume migration control and cleanup of Priority Zones A and B.

Water Board staff believe that it is necessary and appropriate to be conservative in our groundwater cleanup requirements, particularly for those areas where a public drinking water supply is affected, threatened and will remain at risk for an extended period of time. This requirement evolved from the overwhelming concern from most stake-holders, particularly the affected well-owners (represented by PCAG), with respect to the expediency in which groundwater cleanup activities will be implemented and the uncertainties concerning the length of time that Olin estimates it will require to achieve water quality objectives for the affected portion of the Llagas Subbasin. More importantly, we agree with the affected well-owners' opinion with that the time (Olin estimates at least 12 years to achieve the MCL within the intermediate zone) that their water supply will remain impaired is too long.

Therefore, Central Coast Water Board staff has amended the proposed cleanup order to require Olin to implement aggressive and prompt groundwater cleanup (hydraulic containment and remediation) not only within Priority Zone A, but also within Priority Zone B in the intermediate aquifer. We believe this requirement will not cause any significant delays with the overall implementation schedule as the containment system has yet to be designed and constructed. By targeting Priority Zone B (i.e., extending the capture zone of the proposed groundwater extraction wells), cleanup time-frames will be accelerated and will result in the effective cleanup of the affected domestic supply wells much sooner than with the present approach.

From a technical perspective, we fully understand the basis for the proposed groundwater cleanup strategy and approve of it for those portions (Aquifer zones) of the Llagas Subbasin that are not presently being used as a primary source of drinking water (e.g., shallow and deep aquifer zones).

Due to the timing with respect to finalizing this item and posting it on our website and mailing deadlines, we intend to revise all references to the term, "Plume Core" so that it is clear that our CAO's requirement for active containment of the plume core shall extend to those areas in Priority Zone B within the intermediate aquifer only.

Central Coast Water Board staff solicited public comments on September 18, 2007 on the proposed CAO No. R3-2007-0077 and provided a 45-day comment period to facilitate the community's participation. In October and November 2007, Water Board staff also presented and discussed the draft order at two Perchlorate Community Advisory Group (PCAG) meetings in San Martin. Staff received and considered comments from several interested parties and has made changes to the proposed CAO No. R3-2007-0077, as deemed appropriate. We received and considered comments from the following individuals and organizations:

- Olin Corporation

- City of Morgan Hill
- PCAG
- City of Gilroy
- Santa Clara Valley Water District
- Assembly Member John Laird
- Dr. Richard M. Peekema
- Perchlorate Working Group (consists of City of Gilroy, City of Morgan Hill, County of Santa Clara, and Santa Clara Valley Water District)
- Ms. Andrea Ventura

Attachment 1 is a copy of the proposed CAO Order No. R3-2007-007. The finalized CAO reflects all changes made as a result of comments received and staff's attempt to clarify the proposed Order. Our specific "Staff Response" to all comments received is enclosed as Attachment 2. The comments are abridged whenever possible. Copies of all comments received (Attachment 3) can be accessed via our website: <ftp://swrcb2a.swrcb.ca.gov/pub/rwqcb3/Olin%20Perchlorate/December%207%2007%20Board%20Meeting/>

In addition to Olin Corporation, the City of Morgan Hill requested to be a designated party and offer comment on the proposed CAO Order No. R3-2007-007 at the Board meeting on December 7, 2007.

Update Concerning Other Potential Sources

The Discharger and the City of Morgan Hill have provided data indicating an unexplained presence of perchlorate concentrations in groundwater in the upper reaches of the Llagas Subbasin, which are not attributed to the Olin Facility. However, the Discharger has not demonstrated, based on sound scientific evidence, that there are other sources of the long-term perchlorate concentrations for the majority of the Llagas Subbasin including the area immediately north and northeast of the Facility or other discrete areas within the Llagas Subbasin. Until the Discharger substantiates its assertion that other source(s) of perchlorate are contributing to the detected impacts, the Central Coast Water Board will continue to find that the source in the area immediately north and northeast of the site is the Olin Facility.

Update Concerning Replacement Water

Olin continues to provide bottled drinking water to well owners and tenants whose wells have perchlorate concentrations greater than 6.0 µg/L. Olin provides bottled water in accordance with the Central Coast Water Board Cleanup or Abatement Order No. R3-2004-0101, as revised by the State Water Resources Control Board in its Order WQ 2005-0007 (State Water Board Order) and Central Coast Water Board staff's letter dated October 6, 2006. The October 6, 2006 letter provides comments and clarifies all replacement water requirements (e.g., bottled water) and post bottled water termination monitoring.

To date, Central Coast Water Board staff has determined that the State Water Board Order criteria have been met for 10 phases of bottled water service termination. Central

Coast Water Board's Executive Officer has concurred with Olin's request to terminate bottled water service for 551 wells, in accordance with State Board Order requirements. Additionally, users of 27 wells have had bottled water reinstated because perchlorate concentrations above 6 µg/L were detected through post-bottled water termination monitoring. Central Coast Water Board staff will continue to review and evaluate all data submitted by Olin that is associated with bottled water terminations and post-bottled water termination monitoring. Currently, Water Board staff is reviewing Phase 11 bottled water termination request.

Presently, Olin provides bottled drinking water to owners and tenants at 114 wells that do not meet State Water Board criteria for terminating bottled water service. 37 of 281 domestic supply wells sampled during the third quarter of 2007 contained perchlorate concentrations above 6 µg/L.

Ion Exchange (IX) System Installations

Olin operates ion exchange (IX) systems on 15 domestic supply wells. Olin began IX system installation at wells exceeded 10 µg/L, then at wells with concentrations between 8.0-9.9 µg/L. Currently, all domestic supply wells with perchlorate concentrations greater than 8.0 µg/L have IX systems on them (three of which are municipal water supply wells in the San Martin community). There are two domestic wells with concentrations of perchlorate greater than 8.0 µg/L that do not have IX systems. Olin has not scheduled installation of IX systems for these wells because one is located on a vacant property and the other well is not being used as a potable source.

Regulatory Standards

On October 18, 2007, the California Department of Public Health (CDPH) established an MCL of 6.0 µg/L for perchlorate in drinking water. The MCL is the maximum concentration of a chemical that is allowed in public drinking water systems. According to CDPH, the MCL is an enforceable standard and is set as close to the public health goal (PHG) as feasible and is based upon treatment technologies, costs (affordability), and other feasibility factors, such as availability of analytical methods, treatment technology, and costs for achieving various levels of removal.

RECOMMENDATION:

Direct the Executive Officer to issue Central Coast Water Board Cleanup and Abatement Order No. R3-2007-0077 concerning Olin Corporation, 425 Tennant Avenue, Morgan Hill, Santa Clara County, as presented.

ATTACHMENTS:

1. Proposed CAO No. R3-2007-0077
2. Central Coast Water Board Staff Response to Comments
3. Refer to: <ftp://swrcb2a.swrcb.ca.gov/pub/rwqcb3/Olin%20Perchlorate/> for comments submitted by:
 - Comment by Santa Clara Valley Water District
 - Comment by City of Gilroy

- Comments by Olin Corporation
- Comment by City of Morgan Hill
- Comment by Perchlorate Community Advisory Group
- Comment by Assembly Member John Laird
- Comment by Dr. Richard Peekema
- Comment by Perchlorate Working Group
- Comment by Ms. Andrea Ventura